

Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

To: Richard Hyde, P.E., Director
Air Permits Division

Date: September 1, 2006

Thru: Michael Honeycutt, Ph.D., Manager *MJH*
Toxicology Section, Chief Engineer's Office

From: Valerie E. Meyers, Ph.D. *VEM*
Toxicology Section, Chief Engineer's Office

Subject: Interim Silica Health Effects Screening Level

Conclusions

The current short-term Effects Screening Levels (ESL) for amorphous fused silica and most forms of crystalline silica are $0.5 \mu\text{g}/\text{m}^3$. The exception is crystalline quartz, which currently has a long-term ESL of $1 \mu\text{g}/\text{m}^3$. Corresponding long-term ESLs are currently 0.05 and $0.1 \mu\text{g}/\text{m}^3$. The Toxicology Section recommends that a value of $10 \mu\text{g}/\text{m}^3$ be applied as an interim short-term ESL to all forms of crystalline silica as well as amorphous fused silica until updated Effects Screening Levels are developed. Consequently, the Toxicology Section recommends that a value of $1 \mu\text{g}/\text{m}^3$ be applied as an interim long-term ESL.

Background

Silica is a common name for silicon dioxide (SiO_2). Silica exists in two primary forms. One in which the atoms are arranged in a fixed geometric pattern, known as crystalline silica. The other, in which no spatial order of the atoms exists, is known as amorphous silica. Several polymorphic forms of crystalline silica exist, including quartz, cristobalite, and tridymite. Amorphous silica occurs naturally or is manufactured synthetically. Amorphous fused silica is contained in fly ash resulting from coal combustion.

Evaluation

The current short-term ESLs for crystalline silica are based on Threshold Limit Values (TLV) published by the American Conference of Governmental Industrial Hygienists. The TLV of $0.05 \text{mg}/\text{m}^3$ for crystalline silica species was set to protect against the chronic fibrotic lung disease, silicosis, in occupational workers. The current ESL for amorphous fused silica is based on the Recommended Exposure Limit (REL) of $0.05 \text{mg}/\text{m}^3$ published by the National Institute for Occupational Safety and Health. Both occupational exposure values were divided by a safety factor of 100 and 1,000 to establish the current short-term and long-term ESLs, respectively. The resulting long-term ESLs for crystalline and amorphous fused silica ($0.05 \mu\text{g}/\text{m}^3$) are therefore quite conservative.

Recently, the California Office of Environmental Health Hazard Assessment performed benchmark analysis to determine a chronic inhalation exposure level that would be expected to protect the general public over a lifetime of exposure. Data from several studies resulted in a range of $3\text{-}10 \mu\text{g}/\text{m}^3$. Based on these data and considering potential cumulative effects, the

X-Mailer: Novell GroupWise Internet Agent 6.5.6
Date: Thu, 19 Apr 2007 15:17:11 -0500
From: "Michael Honeycutt" <MHoneycu@tceq.state.tx.us>
To: "Jim Tarr" <jtarr@stonelions.com>
Cc: "Valerie Meyers" <VMeyers@tceq.state.tx.us>
Subject: Re: Interim Silica Health Effects Screening Level

Hello Mr. Tarr,

I responded to your email within a few days of receiving it. You sent the same list of questions to Dr. Valerie Meyers, who works with me in the Toxicology Section. She answered your questions in the attached email.

Cheers!

Michael Honeycutt, Ph.D.
Manager, Toxicology Section
Texas Commission on Environmental Quality
PO Box 13087 MC-168
Austin, TX 78711-3087
Phone: 512-239-1793
Fax: 512-239-1794

>>> Jim Tarr <jtarr@stonelions.com> 4/19/2007 12:55 PM >>>
Dear Mr. Honeycutt,

Have you had an opportunity to review my questions concerning the interim silica ESL? I would appreciate a response.

Thank you,

Jim Tarr
Stone Lions Environmental Corporation
950 Indian Peak Road, Suite 210
Rolling Hills Estates, CA 90274
310-377-6677

At 03:06 PM 4/4/2007, Jim Tarr wrote:

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>value on their work? If not what did you base it on?
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>Jim Tarr
>Stone Lions Environmental Corporation
>950 Indian Peak Road, Suite 210
>Rolling Hills Estates, CA 90274
>310-377-6677

Date: Thu, 19 Apr 2007 15:04:33 -0500
From: "Valerie Meyers" <VMeyers@tceq.state.tx.us>
To: "Michael Honeycutt" <MHoneycu@tceq.state.tx.us>
Subject: Fwd: Re: Interim Silica Health Effects Screening Level
Mime-Version: 1.0
Content-Type: multipart/alternative; boundary="=__Part83A4EF41.2__="

>>> Valerie Meyers 4/5/2007 9:48 AM >>>
Jim,

I apologize for not getting back to you sooner. I was out of town last week for the Society of Toxicology meeting and involved in legislative briefings this week.

Regarding your questions,

1. Why was this change made on September 1, 2006? Who requested it?

This review was initiated internally, and the memo was completed immediately following review of the California REL.

2. Why didn't you wait until a permanent health effects screening level for silica (instead of an interim value) could be developed?

As you know, we are undergoing a formal review process of our current ESLs. We are currently reviewing approximately 25 chemicals. The list can be found at:

http://www.tceq.state.tx.us/implementation/tox/esl/develop_list.html

In the meantime, stakeholders can request interim review of chemicals that are not currently undergoing exhaustive review. Another recent example of this is nitrous oxide (Memo from Vincent Leopold to Richard Hyde dated February 13, 2007).

3. The California Office of Health Hazard Assessment did not address amorphous silica; did you base your change to the amorphous silica value on their work? If not what did you base it on?

The California REL addressed diatomaceous earth, which is primarily amorphous silica during extraction and primarily the cristobalite form of crystalline silica after calcination. Studies of amorphous silica indicate that it is likely less toxic than crystalline silica. Therefore, including it in the composite for the interim ESL is a conservative approach.

Valerie

>>> Jim Tarr <jtarr@stonelions.com> 4/3/2007 1:24 PM >>>
Dear Ms. Meyers, Mr. Honeycutt, and Mr. Hyde;

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X-Mailer: Novell GroupWise Internet Agent 6.5.6
Date: Wed, 25 Apr 2007 15:24:08 -0500
From: "Richard Hyde" <RHyde@tceq.state.tx.us>
To: "Jim Tarr" <jtarr@stonelions.com>,
"Michael Honeycutt" <MHoneycu@tceq.state.tx.us>
Cc: "Mike Gould" <MGOULD@tceq.state.tx.us>
Subject: Re: Interim Silica Health Effects Screening Level

Thanks....he never responded once I mentioned your name so maybe he found it.

>>> Michael Honeycutt 4/19/2007 4:07:23 PM >>>
Hi Richard,

We did answer Mr. Tarr's questions. The response we sent to him is attached.

Mike

Michael Honeycutt, Ph.D.
Manager, Toxicology Section
Texas Commission on Environmental Quality
PO Box 13087 MC-168
Austin, TX 78711-3087
Phone: 512-239-1793
Fax: 512-239-1794

>>> Richard Hyde 4/19/2007 3:36 PM >>>
Jim,

I was told that we answered your question. Did you not get an email from Dr. Michael Honeycutt? If not, I will check into it.

Richard A. Hyde, P.E.
Director, Air Permits Division
Texas Commission on Environmental Quality
Office: 512.239.1308
Fax: 512.239.3341
rhyde@tceq.state.tx.us

>>> Jim Tarr <jtarr@stonelions.com> 4/19/2007 12:55 PM >>>
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Date: Thu, 19 Apr 2007 15:36:37 -0500
From: "Richard Hyde" <RHyde@tceq.state.tx.us>
To: "Jim Tarr" <jtarr@stonelions.com>
Cc: "Mike Gould" <MGOULD@tceq.state.tx.us>, "Michael Honeycutt" <MHoneycu@tceq.state.tx.us>
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From: "Michael Honeycutt" <MHoneycu@tceq.state.tx.us>
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Date: Thu, 19 Apr 2007 16:08:57 -0500
From: "Valerie Meyers" <VMeyers@tceq.state.tx.us>
To: "Stone Lions Environmental Corp" <stonlion@stonelions.com>
Cc: "Michael Honeycutt" <MHoneycu@tceq.state.tx.us>
Subject: Re: Interim Silica Health Effects Screening Level (ESL)

Regarding your follow-up questions:

The Toxicology Section manager, Dr. Honeycutt requested that I review the CalEPA evaluation of silica. I spoke with him, and he indicated that TXU did not request an interim review. A recent review article by Merget et al. summarizes the current knowledge about the health effects of amorphous forms of silica. I have attached it here. Animal inhalation studies using amorphous silica do indicate an initial, non-specific response to particles in the lung, but no progression to fibrosis. Human epidemiological studies also indicate that amorphous silica is less likely than crystalline silica to produce fibrosis. I did not contact CalEPA to determine why they did not include amorphous silica in their evaluation. However, CalEPA did utilize a study in their evaluation by Hughes et al. 1998 that speaks directly to the fibrotic potential of crystalline versus amorphous silica in their discussion (see page 812 of the attached manuscript). Despite the evidence that amorphous silica may have less fibrotic potential, it is almost always contaminated with crystalline silica in the environment. Therefore, we chose to include amorphous silica as a conservative approach.

Valerie

>>> Stone Lions Environmental Corp <stonlion@stonelions.com> 4/19/2007 12:58 PM >>>
Dear Ms. Meyers,

Thank you for your response. However, I have further questions regarding the subject matter.

1. Your response to item 1 mentions an internal initiation of the silica work. Who at TCEQ initiated this request?
2. In regard to item 2, did TXU request an interim review?
3. Could you please tell me which specific studies of amorphous silica indicate that it is likely less toxic than crystalline silica? Did California EPA participate in or cite those studies?
4. California EPA did not lump together amorphous and crystalline silica when they developed a standard. There must have been a reason for this. Have you inquired to CA EPA as to why they didn't do this (lump together amorphous and crystalline)? Why were you compelled to combine them?

Thank you,

Jim Tarr
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At 07:48 AM 4/5/2007, you wrote:

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[Merget 2002-health hazards of amorphous silica.pdf](#)



[Hughes 1998-Silicosis risk in diatomaceous earth industry.pdf](#)